# TECHNICAL SUPPORT DOCUMENT

This document serves as the statement of basis as required by 40 CFR part 124. This document sets forth the legal and factual basis for permit conditions, including references to applicable statutory or regulatory provisions, including provisions under 40 CFR § 52.21. This Technical Support Document is for all interested parties of the permit.

## 1. GENERAL INFORMATION

### 1.1 Applicant and Stationary Source Information

| | |
|---|---|
| **Permitting Authority:** | United States Environmental Protection Agency<br>Region 5<br>77 West Jackson Blvd.<br>Chicago, Illinois 60604 |
| **Air Quality Permit Number:** | PSD-ML-R50005-02-01 |
| **Owner/Operator Name and Address:** | Mille Lacs Band Corporate Commission<br>dba/Grand Casino Hinckley<br>777 Grand Avenue<br>HCR 67, Box 240<br>Onamia, Minnesota 56359 |
| **SIC Code:** | 7011, Hotels and motels |
| **Facility Location** | Grand Casino Hinckley<br>777 Lady Luck Drive<br>Route 3, Box 15<br>Hinckley, Minnesota 55037 |
| **Responsible Official:** | Mitch Corbine<br>Commissioner of Corporate Affairs<br>Mille Lacs Band Corporate Commission<br>dba/Grand Casino Hinckley<br>Phone: (320)532-8882 (office)<br>Phone: (320)384-7777 (hotel/casino) |
| **Permit Contact:** | Phillip Kairis<br>Vice President<br>Energy Alternatives, Inc.<br>Phone: (612)245-3750<br>Fax: (651)460-6717 |

## 1.2 FACILITY DESCRIPTION

The Mille Lacs Band Corporate Commission dba/Grand Casino Hinckley proposes to install three internal combustion engines at the Grand Casino Hinckley at 777 Lady Luck Drive, Hinckley, Minnesota 55037. The engines will be owned and operated by the Mille Lacs Band Corporate Commission dba/Grand Casino Hinckley (applicant), and located on land that is held in trust for the Mille Lacs Band of Ojibwe. The location of the facility housing the engines is approximately one and one half mile east of I-35, south of Highway 48 in Pine County, Minnesota.

The shaft power of each engine will drive a 1825 kilowatt generator to produce electricity. The electricity produced will be used for peak load management and backup power for Grand Casino Hinckley. The total generation capacity of the engines will be 5.5 megawatt. Electricity generated at the facility will not be sold for distribution. The project is major for the Prevention of Deterioration (PSD) permitting because the potential to emit nitrogen oxide ($NO_x$) emissions from the engine generator project is above 250 tons per year (tpy).

The three engines will each be Caterpillar Model 3516B turbocharged engines. The Caterpillar 3516B engines each have 16 cylinders. Each engine operates at a rated speed of 1800 revolutions per minute and produces shaft power of 2,593 brake horsepower. Each engine will burn approximately 130.2 gallons per hour of low sulfur (0.05%) diesel fuel when operated at capacity.

A building will house the three engine generator sets and a control room. It will occupy approximately 2,450 square feet. Additional space outside the building will be required for the electrical transformers, related interconnection equipment, and road access. A 10,000 gallon underground diesel fuel tank is proposed for installation adjacent to the building, and will be subject to underground storage tank regulations under the Resource Conservation, and Recovery Act.

The emission units, control equipment and emission stacks at the stationary source authorized in this permit are described in the PSD construction permit application submitted to the United States Environmental Protection Agency (EPA) on February 1, 2002.

## 2. POTENTIAL TO EMIT SUMMARY

| Potential Emission Rates | VOC | $NO_x$ | CO | PM | $PM_{10}$ | $SO_2$ | HAPs |
|---|---|---|---|---|---|---|---|
| Potential hourly emissions per engine (lb/hr) | 1.16 | 37.44 | 3.05 | 0.87 | 0.72 | 0.91 | 0.025 |
| Potential hourly emissions 3 engines (lb/hr) | 3.48 | 112.32 | 9.15 | 2.61 | 2.16 | 2.73 | 0.075 |
| Total potential emissions 3 engines (tpy) | 15.24 | 491.96 | 40.08 | 11.43 | 9.46 | 11.98 | 0.329 |
| 800 hours per year Limited potential emissions 3 engines (tpy) | 1.38 | 44.94 | 3.66 | 1.05 | 0.87 | 1.09 | 0.03 |

## 3. PREVENTION OF SIGNIFICANT DETERIORATION REVIEW

### 3.1 Best Available Control Technology Analysis

Since the total potential emissions from the proposed engines is greater than 250 tpy for $NO_x$, the facility is considered a major stationary source and subject to Federal PSD permitting which includes a Best Available Control Technology (BACT) analysis. Therefore, the applicant conducted a BACT analysis for $NO_x$.

The BACT analysis is an analysis of the emissions reductions that can be achieved by any new major stationary source emissions unit and the available pollution control technology that can be used to achieve the emissions reductions. It is a “top-down” process in which all available control technologies are ranked from highest to lowest in order of effectively reducing air emissions. In the “top-down” process, the PSD applicant first examines the most stringent, or “top” control alternative. That alternative is established as BACT unless the applicant demonstrates, and the permitting authority in its informed judgement agrees, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not “achievable” in that case. If the most stringent technology is eliminated in this fashion, then the next most stringent alternative is considered, and so on. The BACT analysis is done on a case-by-case basis. The EPA provides guidance on conducting BACT analyses in the New Source Review Workshop Manual (DRAFT, October 1990).

The BACT analysis for the proposed project is based on a baseline of 8760 operating hours per year at rated capacity. Uncontrolled $NO_x$ emissions at rated capacity are 10.71 grams per brake horsepower-hour (g/BHP-hr), 61.24 pounds per hour (lb/hr), and 268 tpy for each engine based on the manufacturer’s guarantee.

The applicant identified the following control options for determining BACT for the proposed engine generator sets:

- Engine Gas Recirculation
- Fuel Specification (Low Nitrogen Fuel)
- Intake Air Cooling
- No Controls
- Non-Selective Catalytic Reduction
- Non-Thermal Plasma Reactor
- Pre-Ignition Chamber Combustion (also described as Clean Burn Combustion or Pre-Stratified Charge)
- Electronic Fuel Injection Timing Retard
- Rich Burn Combustion
- Selective Catalytic Reduction
- Steam/Water Injection
- Turbocharger with Aftercooler
- A Combination of Control Techniques

Engine gas recirculation, low nitrogen fuel, intake air cooling, non-selective catalytic reduction, non-thermal plasma reactors, pre-ignition chamber combustion, rich burn combustion, selective catalytic reduction, and steam/water injection were eliminated based on technical infeasibility.

Technical infeasibility can include technical difficulties that would preclude successful use of a control option for the emissions unit under review. It can be demonstrated through physical, chemical, and engineering principles. Two key concepts in determining whether a control technology is feasible are whether it is commercially available and whether it can be reasonably installed and operated on the emissions unit under review.

Of the remaining control options, the median $NO_x$ emission rate in g/BHP-hr was used to rank the control alternatives by effectiveness. The top alternative or, most effective control option, was determined to be electronic fuel injection timing retardation in combination with turbochargers with aftercoolers to achieve a median $NO_x$ emission rate of 8.15 g/BHP-hr. Since all compression-ignition engines, which include diesel engines, are lean-burn engines, lean burn combustion is an inherent function of these proposed units. Thus, lean-burn combustion technology was not considered as a separate control option for BACT.

Since the $NO_x$ emission rate is largely determined by the design of the engine, the applicant examined the $NO_x$ emission rates from the commercially available engines at the required rating of 1825 kilowatt and found three engine types which incorporate a combination of control techniques to achieve different levels of

$NO_x$ emission control. The most effective diesel fired internal combustion engine for $NO_x$ reduction examined by the applicant is the Low Emission Engine. This engine uses a combination of control techniques, including incorporation of lean burn combustion, electronic fuel injection timing retard, and a turbocharger with aftercooler. The Low Emissions Engine achieves an emission rate of 6.55 g/BHP-hr, which is below the median $NO_x$ emission rate of the top alternative in the BACT analysis.

Additional analysis shows no adverse economic, environmental and energy impacts associated with installation of the Low Emissions Engine as BACT, as compared to other feasible options.

### 3.2 Air Quality Analysis

The PSD review requires an applicant to conduct an air quality analysis of the ambient impacts associated with the construction and operation of the proposed new source. The main purpose of the air quality analysis is to demonstrate that new emissions emitted from the proposed major stationary source, in conjunction with other applicable emissions from existing sources in the area, will not cause or contribute to a violation of any applicable National Ambient Air Quality Standards or PSD increment. An air quality analysis is also required for any pollutant increases from a proposed new or modified source planning to construct within 10 kilometers of a Class I area and has an ambient impact on such an area equal to or greater than 1 micrograms per cubic meter ($\mu g/m^3$), based on a 24-hour average.

The applicant is required to conduct an air quality analysis for $NO_x$. Generally, the analysis involves (1) an assessment of existing air quality, which may include ambient monitoring data and air quality dispersion modeling results, and (2) predictions, using dispersion modeling, of ambient concentrations that will result from the proposed project and future growth associated with the project.

The dispersion modeling analysis usually involves two phases: (1) a preliminary analysis and (2) and a full impact analysis. The preliminary analysis models only the significant increase in potential emissions of a pollutant from the proposed source and the results of this analysis determine whether a PSD applicant must perform a full impact analysis. A full impact analysis involves estimating background pollutant concentrations resulting from existing sources and growth associated with the proposed source. In addition, the applicant must still address additional impact analysis requirements required under 40 CFR 52.21 (o).

ISCST3 modeling was used to conduct the air quality analysis for the Grand Casino Hinckley Peaking Power Station to assess potential $NO_x$ air quality impacts from the three engine generating units. Since the applicant plans to operate each of the peaking units at no more than 800 hours per year, and this operational condition will be enforceable under the PSD permit, this operational condition was included in the air quality analysis. The modeling results showed impact concentrations below the annual significance level of 1 $\mu g/m^3$ at 800 hours per year of operation, and a full impact analysis was not required.

### 3.3 Additional Impact Analysis

For the additional impact analysis, the applicant must examine growth in the area due to the project, analyze the impacts of emissions from the project on the ambient air quality and the soils and vegetation in the area, and analyze any visibility impairment due to the project. The additional impact analysis showed no significant impacts on visibility, soils and vegetation in the surrounding area.

### 3.4 Class I Area Impact Analysis

For sources that have the potential to impact PSD Class I areas, additional analyses need to be conducted to demonstrate compliance with PSD Class I area increments, as well as any impacts on Air Quality Related Values associated with the PSD Class I area such as, visibility, water quality, flora and fauna.

The Grand Casino Hinckley Peaking Power Station is located approximately 123 kilometers west of the Rainbow Lakes Wilderness Area, the nearest PSD Class I area. Consequently, the Federal Land Manager for the National Park Service office in Denver, Colorado requested that the applicant perform an impact analysis for the Rainbow Lakes Wilderness Area.

A modeling analysis was conducted using the CALPUFF model. The Rainbow Lakes Wilderness Area does not have visibility as an Air Quality Related Value. Therefore, the analysis submitted evaluated concentration impacts of $SO_2$, $PM_{10}$, and $NO_2$. The analysis also evaluated impacts from nitrogen and sulfur deposition. The results of the analysis showed that both the concentration and deposition values for each of these pollutants is well below the PSD Class I significant impact level.

### 3.3 Emissions Limits and Monitoring/Testing

| Emissions Limitation | Monitoring | Basis |
|---|---|---|
| $NO_x$: 6.55 g/BHP-hr per engine<br>$NO_x$: 37.44 lb/hr per engine | Conduct an initial performance test; Conduct a performance/ stack test every three (3) years; Conduct an annual emissions test using a portable emissions analyzer during the calender years between the periodic performance tests | BACT<br>40 CFR § 52.21 |
| $NO_x$: 14.98 tpy per engine | Recordkeeping of monthly $NO_x$ emissions for each engine based on a twelve month rolling sum | BACT<br>40 CFR § 52.21 |
| 800 hr/year per engine | Recordkeeping of monthly operating hours for each engine based on a twelve month rolling sum | Air Quality Analysis<br>40 CFR § 52.21 |
| Turbocharger /w Aftercooler operation: maintain the aftercooler return water temperature for each engine at less than or equal to 140 degrees Fahrenheit. | Continuously monitor aftercooler temperature of each engine | BACT<br>40 CFR § 52.21 |
| Electronic injection timing retardation: flash file program #180-1736 shall be set for retard engine timing | Maintain records of flash file program #180-1736 which establishes retard engine timing parameters | BACT<br>40 CFR § 52.21 |
| Combustion operation: intake manifold pressure at 28.1 to 76.2 in Hg for 40 to 100% load for each engine | Continuously monitor the intake manifold pressure | BACT<br>40 CFR § 52.21 |

The permit requires the applicant to conduct a stack or performance test every three (3) calender years, with the first test required to be conducted three years following the initial compliance test. The applicant will use a portable emissions analyzer to measure $NO_x$ emissions annually during years in which a periodic stack or performance test is not required. The portable emissions analyzer must be set up and used according to the testing methods and principles in the Portable Electrochemical Analyzer Procedure (attachment 2 of the permit).

This method is applicable to the determination of nitrogen oxides (NO and $NO_2$ ), carbon monoxide (CO) and oxygen ($O_2$) concentrations in controlled and uncontrolled emissions from combustion sources using fuels such as natural gas, propane, butane, and fuel oils. This method is designed to provide a reasonable assurance of compliance using periodic monitoring or testing.

The permit requires Mille Lacs Band Corporate Commission dba/Grand Casino Hinckley to maintain records of all measurements and other data required in the permit for at a period of least five (5) years after the effective date of the permit. The permit also requires Mille Lacs Band Corporate Commission dba/Grand Casino Hinckley to submit reports to the EPA Region 5 office, including an annual compliance certification to certify compliance with the emissions limitations and other applicable terms of the permit.